Cost Proxy Model
System Design: Customer Data

Geographic Data

- **Household file at Grid level. (CENSUS.CSV)** Census level data or some other substitute for Residential lines. This file contains household count information at the grid level.
- **Daytime population file at Grid level. (DAYPOP.CSV)** Census level data or some other substitute for Business lines. This file contains daytime population values at the grid level.
- **State Grid file (ST_GRID.CSV)** State information at grid level that provides the political district, CLLI, distance to CLLI from the center of the grid, and square mile area of each grid.
- **Terrain file (TERRAIN.CSV)** State information that provides the terrain characteristics of each Grid.

Cost Proxy Model
System Design: Lookup/Decode Data

Customer/Lookup Data

- **Usage Values file (USAGE.CSV)** Provides the monthly number of messages per service as well as the associated shared switching investment.
- **Wire Center file (WC.CSV)** State information that provides location, owner, tariffed rates, and switch type for each CLLI (wire center) within the state.
- **Operating Exp. Ratios file (OPX_RTO.CSV)** Provides ratios to estimate a company's operating expenses as compared to the statewide average operating expenses .
- **Feeder Route/Air Ratios file (FDR_RTO.CSV)** Converts air feet to estimated route feet in the feeder plant.
- **Density Type file (DENS_TYP.CSV)** Provides the definition of the Density types used in the model.
- **Distance Type file (DIS_TYP.CSV)** Converts air feet to estimated route feet in the distribution plant.
- **Engineering Rules file (ENG_RUL.CSV)** Provides some of the basic engineering rules.
- **Feeder % W/O SAI file (MIS_SAI.CSV)** Provides the ratio of feeder to distribution plant for a given total distance.
- **Surface Classifications file (SURF.CSV)** Provides the indication of which soil types affect installation costs.
- **Factors file (FACTORS.CSV)** Provides conversion factors for census data. These conversions are for Households to Residence lines and Daytime population to Business lines.

Cost Proxy Model
Customer Engine: Customer File

OBS	CLLI	SAI	LAT_C	LONG_C	CBG	COS	ST_SEN	ST_REP	DENS_TYP	TERR_TYP	STATE	COMPANY	DISTANCE	LINES	FDR_DIST
78	SNRACA13	1100	38.005	-120.375	61090012001	1FR	12	25	Z4	N	CA	PACIFIC	3.78132	67	7.0861
79	SNRACA13	1101	38.005	-120.445	61090021988	1FR	12	25	Z2	M	CA	PACIFIC	8.57932	9	18.3612
80	SNRACA13	1101	38.005	-120.435	61090021988	1FR	12	25	Z2	M	CA	PACIFIC	7.53037	9	16.1163
81	SNRACA13	1101	38.005	-120.425	61090021988	1FR	12	25	Z2	M	CA	PACIFIC	6.51978	12	13.9535
82	SNRACA13	1101	38.005	-120.415	61090051002	1FR	12	25	Z3	H	CA	PACIFIC	6.74975	9	10.6725
83	SNRACA13	1101	38.005	-120.405	61090051002	1FR	12	25	Z3	H	CA	PACIFIC	5.71223	112	9.0320
84	SNRACA13	1101	38.005	-120.395	61090011002	1FR	12	25	Z4	M	CA	PACIFIC	3.56791	125	9.3593
85	SNRACA13	1110	38.005	-120.365	61090012001	1FR	12	25	Z3	N	CA	PACIFIC	4.53817	6	7.1756
86	SNRACA13	1110	38.005	-120.355	61090012001	1FR	12	25	Z2	N	CA	PACIFIC	5.24437	6	8.2923
87	SNRACA13	1111	38.005	-120.345	61090012002	1FR	12	25	Z3	N	CA	PACIFIC	6.19477	16	9.7950
88	SNRACA13	1111	38.005	-120.335	61090022007	1FR	12	25	Z3	N	CA	PACIFIC	7.29543	31	11.5353
89	SNRACA13	1111	38.005	-120.325	61090022007	1FR	12	25	Z3	N	CA	PACIFIC	5.72880	38	16.3272
90	TLMNCAXF	1101	38.005	-120.245	61090032002	1FR	12	25	Z2	N	CA	CITIZENS TUOLOMNE	7.57075	16	16.2027
91	TLMNCAXF	1111	38.005	-120.235	61090032002	1FR	12	25	Z2	N	CA	CITIZENS TUOLOMNE	7.49444	20	16.0394
92	TLMNCAXF	1111	38.005	-120.225	61090031985	1FR	12	25	Z2	N	CA	CITIZENS TUOLOMNE	7.59699	11	16.2589

Cost Proxy Model
Customer Engine: SAI File

OBS	CLLI	SAI	DISTANCE	TECH_TYP	DENS_TYP	TERR_TYP
1	SNRACA13	1000	1	CF	Z3	N
2	SNRACA13	1001	1	SLC	Z3	N
3	SNRACA13	1010	1	CF	Z3	N
4	SNRACA13	1011	1	SLC	Z3	N
5	SNRACA13	1100	1	CF	Z3	N
6	SNRACA13	1101	1	SLC	Z3	N
7	SNRACA13	1110	1	CF	Z3	N
8	SNRACA13	1111	1	SLC	Z3	N
9	TLMNCAXF	1000	1	CF	Z3	N
10	TLMNCAXF	1001	1	SLC	Z3	N
11	TLMNCAXF	1010	1	CF	Z3	N
12	TLMNCAXF	1011	1	SLC	Z3	N
13	TLMNCAXF	1100	1	CF	Z3	N
14	TLMNCAXF	1101	1	SLC	Z3	N
15	TLMNCAXF	1110	1	CF	Z3	N
16	TLMNCAXF	1111	1	SLC	Z3	N

Cost Proxy Model
Customer Engine: CLLI File

SW_TYP	COS	DENS_TYP	BH_MOU	BH_MSG	COMPANY	CLLI	CBG	LAT	LONG	TOT_LINE	REVENU_T
5E	1FR	Z3	404.7394	107.9707	PACIFIC	SNRACA13	61090012004	37.98	-120.37	12796.6	13.97
D100	1FR	Z3	406.1070	108.3355	CITIZENS	TLMNCAXF	.	37.96	-120.24	2542.7	15.00

Cost Proxy Model
System Design: Engineering Data

Engineering/Cost Data

- **OSP (Outside Plant Specifications) Spec file (OSP_SPC.CSV)** Provides percentage of aerial, buried, and underground cable used for a specific grid based on density. This file also contains some outside plant electronics used by a particular service (that is, 1FR).
- **CO/IO (Central Office/Interoffice) Spec file (SIO_SPC.CSV)** Provides the switching and interoffice investment items consumed by a particular service.
- **Stc Svc (Standard Service) Spec file (STD_SPC.CSV)** Based on the definition of Basic Service, provides the operating expense items to include with a service.
- **A + B Cost file (AB_CST.CSV)** Capitalized cost of outside plant equipment.
- **Outside Plt Adj (Plant Adjustment) file (OSP_FCT.CSV)** Provides an adjustment to the capitalized value of cable plant based on the density value and terrain type.
- **Annual Chg Fctr (Charge Factor) file (ACF.CSV)** Annual charge factor table. Used to convert investments into costs.
- **Operating Exp (Expense) file (OTH_EXP.CSV)** Provides operating expenses at a line level in predefined categories (for example, billing).
- **Cable Size file (CBL_SIZ.CSV)** Given certain density zones, this table provides the average outside plant cable size used.
- **Other Inv (Investment) file (OTH_INV.CSV)** This is a file that contains those investment items driven only by lines (for example, terminal, drop, SAI).
- **Fill Level file (FILLS.CSV)** Provides the going forward actual plant utilization rates.
- **Switch / IO (Interoffice) file (SIO_INV.CSV)** Switch and Interoffice investment by line, message, etc.

Cost Proxy Model
Cost Engine: End Product

⇨ Using These Cost Tables, the CPM Creates this Internal Cost Matrix for Each Cost Element

			TERR_TYP			
			High	Medium	Normal	Water
			UNIT INVEST.	UNIT INVEST.	UNIT INVEST.	UNIT INVEST.
OSP_TYP	ELEMENT	DENS_TYP				
Copper Dist.	BUR_CU	Z1	0.2172	0.1694	0.1159	0.2172
		Z2	0.1306	0.1090	0.0779	0.1306
		Z3	0.1367	0.1169	0.0943	0.1367
		Z4	0.1315	0.1077	0.0848	0.1315
		Z5	0.1448	0.1162	0.0867	0.1448
		Z6	0.1329	0.1092	0.0870	0.1329
		Z7	0.1292	0.1018	0.0783	0.1292

Cost Proxy Model
System Design:Specification Files

COS	ELEM_QT	ELEMENT	CUST_TY
1FR	1	ACCT	R
1FR	1	ADV_MKT	R
1FR	1	BILLING	R
1FR	1	COMMON	R
1FR	1	DA	R
1FR	1	EMPSUP	R
1FR	1	ENG_MV	R
1FR	1	GPC_IS	R
1FR	1	MISC	R
1FR	1	NREC	R
1FR	1	NVS_EXP	R
1FR	1	NVS_INV	R
1FR	1	O_MINUS	R
1FR	1	OCS	R
1FR	1	PMO_DIF	R
1FR	1	REPR_MT	R
1FR	1	SALES	R
1FR	1	SEC_INV	R
1FR	1	SHARED	R
1FR	1	TESTING	R
1FR	1	WP_LIST	R

Cost Proxy Model
Sample Calculation: Investment

⇨ Using the Customer File

Record	Lat_c	Long_c	Dens_typ	Terr_typ	Dist_Dist	SAI	CLLI
1	33.055	-116.805	Z1	N	5355	1001	ANHMCA11
2	33.055	-117.005	Z3	M	2300	1110	ANHMCA11

⇨ The Amount of Buried Copper Investment in Distribution for Each "Grid" is

First Record:

Distance	5355
x Percent of Buried (Z1)	60% (OSP Specification File)
x Unit Investment (Z1,N)	.1159
TOTAL	372.39

Second Record:

Distance	2300
x Percent of Buried (Z3)	65% (OSP Specification File)
x Unit Investment (Z3,M)	.1169
TOTAL	174.77

⇨ The Final Step is to Apply the Annual Change Factor to Obtain the Monthly Capital Costs

Cost Proxy Model
Sample Calculation: Operating Expense

⇨ Using the Operating Expense file

Cost Element	Unit of Measure	Operating Expense
ACCT	LINE	0.00427021
ADV_MKT	LINE	0
BILLING	LINE	0.21717087

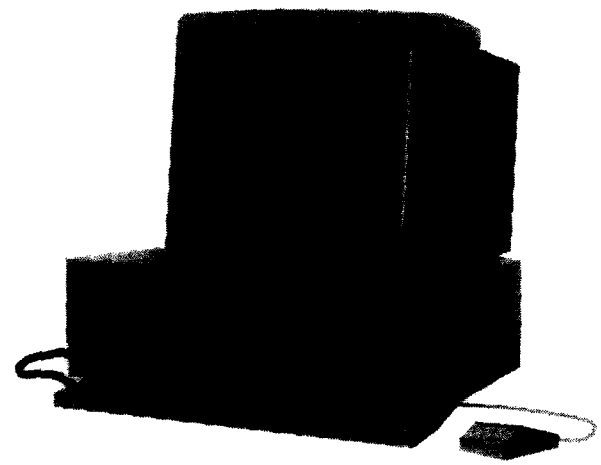
⇨ The Operating Expenses are Adjusted Based on "ARMIS" Ratios

Company	*Lines*	*Op. Exp. (less Depr.)*	*Ratio*
CALAVERAS	2,446	$ 1,205.90	3.9524
CITIZENS	79,229	$ 433.96	1.4259
CONTEL	356,464	$ 467.98	1.5377
DUCOR	770	$ 1,763.51	5.7947
EVANS	8,736	$ 787.10	2.5863
GTE-C	3,567,036	$ 369.72	1.2148
PACIFIC	16,943,623	$ 285.75	0.9389
VOLCANO	8,878	$ 851.76	2.7986
WINTERHAVEN	1,398	$ 757.88	2.4903

⇨ To Approximate the Values for a Specific Company

Company	*Element*	*Expense*
Contel	Billing	0.334

HATFIELD MODEL CRITIQUE



UNIVERSAL SERVICE (96-45)

PROBLEMS WITH HATFIELD MODEL

- Structure of the model
- User unfriendliness
- Erroneous inputs and assumptions
- Proprietary inputs
- Improper validation
- AT&T vs Pacific Bell Comparison

STRUCTURE OF THE MODEL

- Links embedded expense and investment relationships with incremental investments
- Ties structure (poles and conduit) investment to cable sizes
- Can not capture large and small LEC differences
- Fails to incorporate rural clustering

USER UNFRIENDLINESS

- Numerous Excel spreadsheets require manual manipulation
- Requires very large desktop computer
- Slow processing times
- Limited report capability

ERRONEOUS INPUTS AND ASSUMPTIONS

- Ignores wages for 4-1-1 operators (entry level position in telephone industry)
- Ignores wages for customer service representatives
- Links expenses with investment, thereby allowing for expense reductions by reducing investment (by increasing the discount or if a vendor reduces the list price)

ERRONEOUS INPUTS AND ASSUMPTIONS (PG 2)

- Switching factor used reflects lowest factor available, ignoring the reality of high switching investment per line
- Use of prescribed depreciation lives will continue the reserve deficiency problems
- Some inputs based on marginal cost studies not TSLRIC
- Business line averaging understates residence line costs within each zone

PROPRIETARY INPUTS

- Structure factor based on proprietary discussions
- In California, Hatfield Associates admitted that numerous sources of inputs requested anonymity

IMPROPER VALIDATION

- Compared HPM outputs to Centel-Nevada results, comparing rural costs to urban Las Vegas costs
- Comparisons to rural telephone operations non-existent

DEPRECIATION

AT&T uses economic lives for its financials but recommends the LECs use prescribed lives:

	AT&T actual	PB actual	CPM uses	Hatfield uses
Avg Depr Rate	10.9%	6.9%	8.4%	5.5%
Asset Life Years	9.2	14.6	11.9	18

Sourced from data on 1994 FCC Report 43-02 and HPM

WHERE ARE THE COSTS

LECs assets and costs are in the loop, when compared to IXCs (1994 % of TPIS):

	AT&T	Pacific Bell
Cable & Wire Assets	18.3%	42.4%
Revenue	154.4%	33.0%

These numbers reflect high loop investment with low residential rates, source 1994 FCC Report 43-02.

OVERHEADS

Hatfield Model misses on overheads also:

	AT&T	RBOCs	Hatfield
Overheads %	17.7%	11.6%	6.0%

Sourced from 1993 ARMIS reports.

THE COST PROXY MODEL©

CALIFORNIA UNIVERSAL SERVICE SUBSIDY

This package contains the methodology (including descriptions of changes since the last issue) and output for the Cost Proxy Model© California statewide universal service run. The output includes the total state and individual company results. Also included is an addendum concerning Pacific Bell's results.

The output report page for Pacific Bell is Proprietary and Confidential as it contains OANAD cost information. ** REDACTED **

COST PROXY MODEL© STATEWIDE RUN METHODOLOGY

The Cost Proxy Model has estimated the California Universal Service Subsidy requirements. Changes made to the model for this statewide run are:

- use of commercial databases for geographic line estimates,
- additional switch locations and cost methods,
- company specific operating expense estimates,
- OANAD expense updates,
- Shared and Common,
- engineering assumptions changes responding to Coalition suggestions.

COMMERCIAL DATABASES

INDETEC International obtained a database from Bamberg - Handley, Inc. with population, income, ethnic and other demographic information at the 1/100th of a degree of latitude and longitude grid. Analysis was conducted by INDETEC to relate the household and daytime population data to actual Pacific Bell density and residence line counts. The results of the comparison was then applied to the non-Pacific Bell territory by using ratios. The household to residence conversion ratio was 1.175 (R-square>90%). The Daytime Population to Business line conversion ratio was 0.05 (R-square>90%).

Pacific Bell provided to geocode the grid level. This data provided the LEC wirecenters or exchanges based on Pacific's wirecenter boundaries and the CPUC Telephone Exchange map that served a particular grid, the distance from the centroid of the grid to the wirecenter, and the square mileage of each grid. Work is continuing with GTE-C to include their wirecenter boundaries in exchanges with multiple wirecenters.

SWITCH LOCATIONS AND COST METHODS

Pacific Bell used the January 1996 Local Exchange Routing Guide (LERG) to obtain switch address, technology type and carrier for each wirecenter.

Geocoding of the wirecenters were based on number, street, city and zip code in the LERG. Matchmaker software was used to convert the address to latitude and longitude, with the V and H coordinates used if Matchmaker could not assign the latitude and longitude. Approximately 10% of the wirecenters did not geocode in Matchmaker and the V and H values were converted to latitude and longitude based on Bellcore algorithm.

Technology type was analyzed to ensure only digital switches were used. Analog switches were replaced with expected digital counterparts. Cost characteristics from Pacific's SCIS runs of the digital switches included: DMS-100, DMS Remote, 5ESS and

5ESS remote. If a switch technology did not match the switch choices mentioned, then a substitute was made (GTE Tel Ops indicated their GT5 and GTR switches have DMS cost characteristics). If the cost characteristics of a switch technology could not be determined then a DMS-100 switch was assumed .

Switching cost calculations were modified to more closely relate the data to that filed as usage costs in the OANAD proceeding. Backup data to the 24 hour average cost of usage for flat and measured service was analyzed to determine the average cost per message for each type of switch (including remotes). The switch types were determined at each wirecenter described above. In order to maintain investment information on a per line basis, the busy hour investment data was first multiplied by 26 to obtain total monthly cost, then multiplied by 12 to obtain annual costs and, finally, divided by the annual cost factor for switching investments to convert this cost to an equivalent investment.

OPERATING EXPENSE ESTIMATES

Due to the wide variation in California LEC sizes (190 lines to 17,000,000 lines), expenses per line exhibit large variation. Using ARMIS data, a statewide weighted average expense per access line was calculated (this excluded depreciation expense). A factor for each LEC's (except Alltel, CP National and Roseville) total expense per access line compared to Pacific Bell's total expense per access line was developed from the ARMIS reports for 1993. (Ratios for Foresthill and Pinnacles were based on 1994 data). Combining the statewide average expense per line with the actual Pacific Bell Operating Expense data, statewide average values were generated. The ratios from ARMIS for each company were then applied to the statewide average numbers to estimate a particular companies operating expenses. Pacific Bell's factor is 0.93, to reflect a lower than average cost. West Coast, CP National and Roseville were estimated using comparable companies based on size.

OANAD EXPENSE UPDATES

For Universal Service costs Flat and Measured Usage, Directory Assistance and Operator Minus costs are sourced from Pacific's OANAD filing. These expenses are being updated for the OANAD filing.

SHARED AND COMMON EXPENSES ALLOCATION

Changes in the identification of Shared Family costs when the cost object is Universal service, rather than volumes of individual services.

Business, Residence, Public Family.
These costs are the costs of billing end user services. They are volume sensitive with the quantity of accounts, not the volume of services billed on each bill. All costs which are volume sensitive with residential accounts are directly related to Universal Service. Thus, this entire family cost becomes volume sensitive, with the portion being caused by Universal Service the proportion of total accounts which are residential accounts. That portion was directly assigned to Universal Service. The remainder would be assigned to business and public services.

Residence Family
A portion of these costs are the costs associated with residence service center costs which are volume sensitive with residential accounts. All costs which are volume sensitive with residential accounts are directly related to Universal Service. That portion of the family costs which are volume sensitive with residential accounts are directly assigned to Universal Service. The remainder of the costs of the Residence Family are treated as if they are caused by discretionary residential services, with none of these costs being assigned to Universal Service.

ENGINEERING ASSUMPTIONS CHANGES

Due to numerous discussions with all parties involved in the proxy modeling, changes were made to the engineering assumptions.

Route to air ratios for feeder were based on the OANAD Residential Loop sample and additional sampling for the two less dense zones. Cable maps were read to obtain actual route distances. The prior geocoding process provided the air distances from the central offices to the serving area interfaces. The route to air ratios were calculated for each of the seven density zones, and applied to the air distances for ALL of the census derived data. Due to differences in timing of the air distance calculation and the map reading, some customers have changed phone numbers and locations. This affects the route to air calculation if the customer took a phone number to a different location. Therefore route to air ratios under 1.0 or over 4.0 were excluded from the sample.

Other changes include:
Pole line cost factor for the occurrence of 2nd feeder cable on a pole,
Copper feeder utilization adding wirecenters that were missing from prior studies,
Update distribution utilization for 2nd lines,
Change % mix for aerial, buried and underground due to additional wirecenters,
Average cable sizes changed to reflect actual fill instead of exhaust design fills,
Terminal and drop costs were upgraded due to additional field information.